

Isomerism in ~~alk~~alkanes.

all the alkanes we looked @ thus far are straight-chain alkanes

But ~~from~~ from Butane ↑ they have the ability of to form isomers

Isomer - same formula different π ture

Structural isomers - can either exist as straight chain or branched chain

Show butane's isomers. consult drawing pentane's isomers

Nomenclature - Naming - very methodical, very difficult

See slide for Rules

Alkane Reactions

bk C-C bonds and H-C bonds are relatively strong

They are fairly unreactive w/ bases, oxidizers, acids @ 25°C.

They can undergo Combustion.

Substitution Rxns - halogens Replace Hydrogens

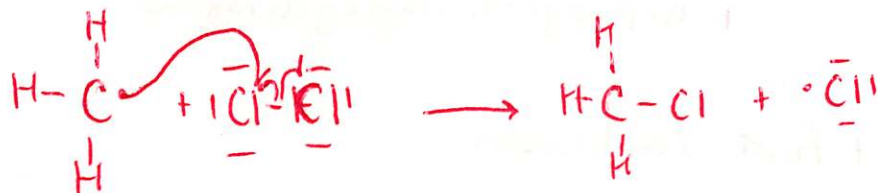
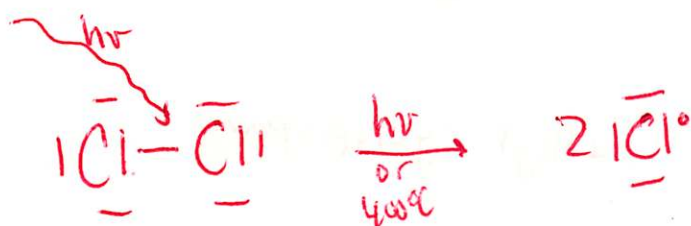
②



If you add Chlorine & Fluorine to Carbon comp's get CFC's

~~Chlorine usually adds to the Carbon w/ the most H's~~

Mechanism



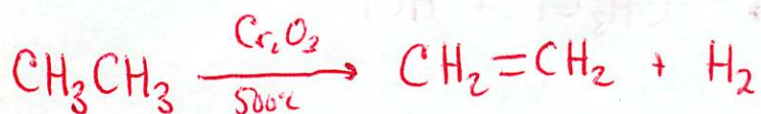
Many ways for Rea to terminate and take ↑ free Radical

For alkanes w/ more than 2 C's the substitution

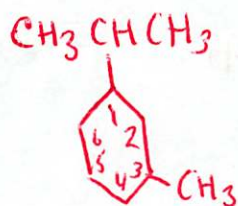
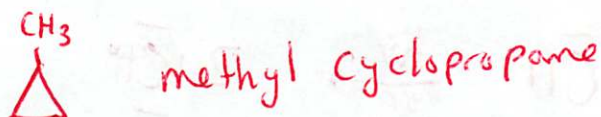
take place @ any C but a "tertiary" C is more reactive than the C w/ less

H gets more Cl w/ more frequency. The e-neg of neighbouring elements makes it more easily attacked.

Dehydrogenation \rightarrow H atoms are removed to give unsat H Carbon



Cyclic alkanes Rings of hydrocarbon alkanes (C_nH_{2n})



~~clockwise~~ clockwise and name in alpha order

1-isopropyl-3-methylcyclohexane

Quickly do chair + Boat conformers.

& Steric Strain molecule

Alkenes / Alkynes

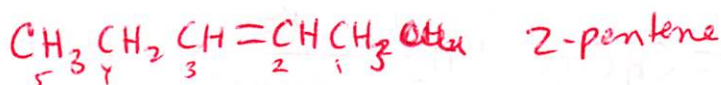
③

UN Saturated Hydrocarbons

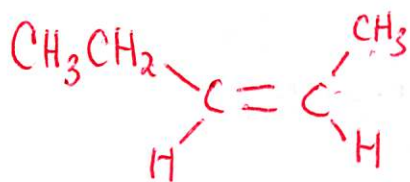
double bonds - alkenes - C_nH_{2n}

differences - ene ending

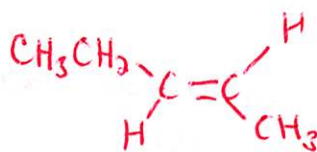
- when double bond is not on 1st carbon
start #ing to give lowest # to double bond



discuss isomerism here. cis trans



Cis-2-pentene



trans-2-pentene

Stereoisomers

differ in how
atoms are arranged
in space. (But same order)

~~different~~ Structural isomers
(constitutional) - same atoms
different configuration

alkynes - at least one triple bond.
get -yne ~~prefix~~ suffix.

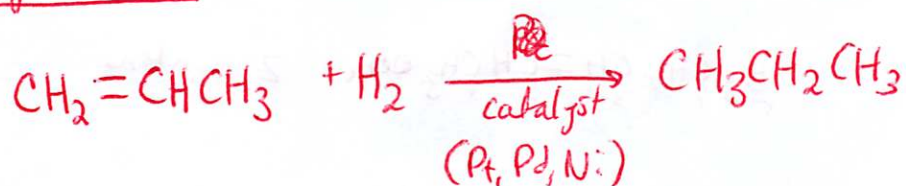
Named same as alkanes/alkenes

Reactions of Alkenes and Alkynes

Several kinds of addition Reactions

π bonds are weaker and are more easily broken forming new σ bonds

Hydrogenation



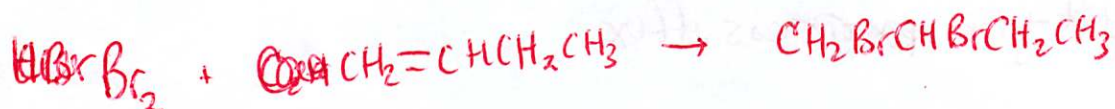
Catalyst facilitates ~~weak~~ breaking of H_2 Bond

done to make unsaturated fats \rightarrow saturated fats
oil solid

"partially hydrogenated vegetable oil."

Halogenation

Br adds to end of Cw/must H's of HBr



aromatic H-carbons

(4)

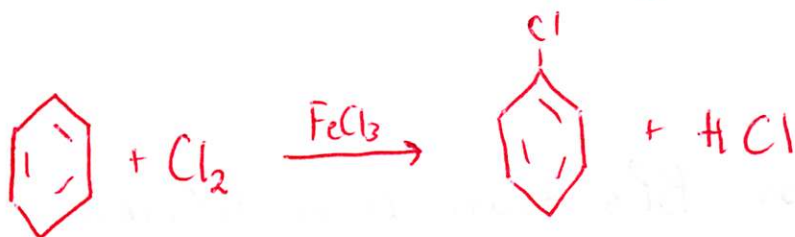
↳ Cyclic unsaturated Rings



← Resonance

doesn't do addition like other alkenes

instead it does substitution (more characteristic of alkenes)
(But aromatic Ring is very stable)



as benzeneside group - called phenyl

Show table of aromatic groups + comps to illustrate

ortho, meta, para

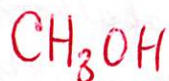
also table of Fused aromatic Rings.

224 H-Carbon Derivatives

↳ functional groups - give different props to hydrocarbon compo

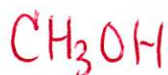
alcohols - $R-OH$ ← hydroxyl group.

Naming changes when lose the "e" and put "ol" to end.



methanol

alcohols have higher BP's than other HCarbons



30g/mol

65°C



30g/mol

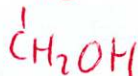
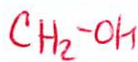
-89°C

Why IM Forces.

Talk uses of ~~Me~~ alcohols

MeOH Syn for adhesives/Acetic Acid

ethylene glycol



antifreeze



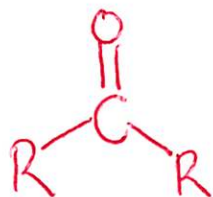
Phenol

Aldehydes + Ketones

⑤



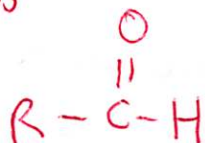
In ketones 2 side chains come off the group



example get -one suffix in naming



aldehydes



get -al suffix

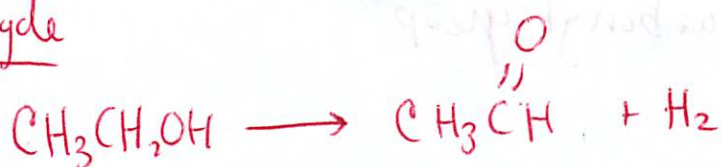


Ketones are used as solvents - acetone.

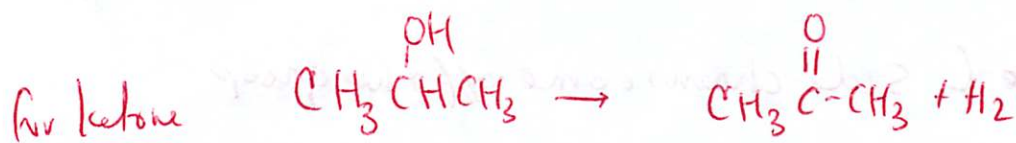
aldehydes have strong odor - cinnamon, vanilla

Made by oxidation of alcohols

for aldehyde

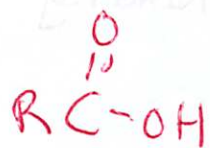


for ketone

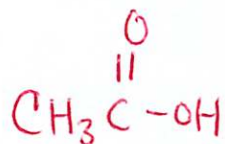


Carboxylic acids + Esters

Carboxyl groups



↳ weak acids - acetic acid

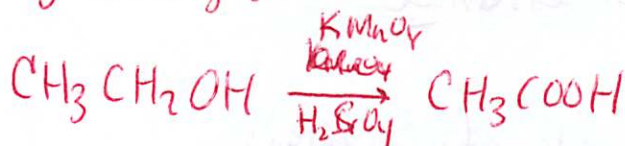


to Name via IUPAC

drop one and add -oic

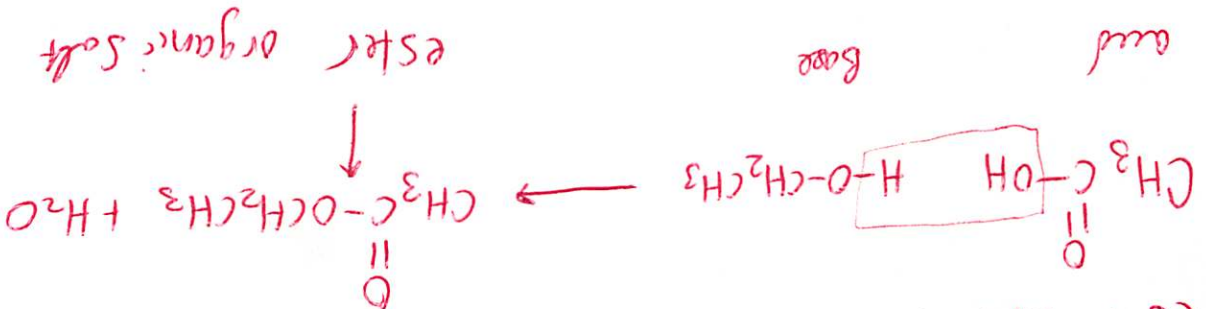
~~and~~ ethanoic acid

Formed by oxidizing an alcohol



Reaction of organic acids

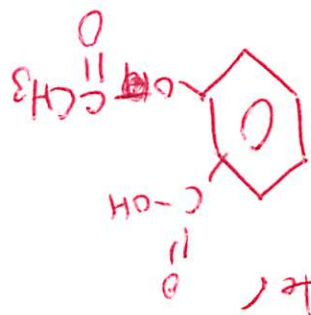
Ester formation



Naming → acid suffix h-oate and alcohol suffix h-yl

ethyl-ethanoate

Esters have sweet fruity odor.



Aspirin is an ester

methylethyl ether



Ether
R-O-R'

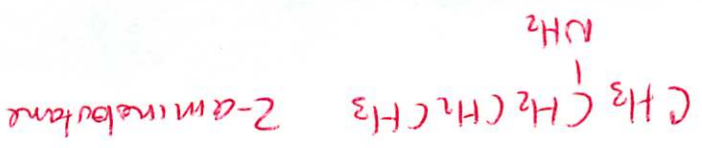
Amines → ammonia w/ C side chain

1 C chain - 1° amine
2 C chain 2° amine
3 C chain 3° amine

Bad odor → urea, putrescine
cadaverine
 $\text{NH}_2(\text{CH}_2)_3\text{NH}_2$ $\text{NH}_2(\text{CH}_2)_5\text{NH}_2$

Commonly done as

-NH₂ amino group



ORGANIC CHEMISTRY Overview

1. Aliphatic Hydrocarbons:

1. **saturated, unsaturated**
 1. **Alkanes:** *propane*
 2. **Alkenes:** *ethene* or ethylene
 3. **Alkynes:** *butyne*
 4. **Linear, Branched, Cyclo-**

2. Aromatic Hydrocarbons

1. Substitution: ortho, para, meta

3. Nomenclature

1. Carbon chain length: prefix
2. -ane, -ene, yne suffix

4. Functional Group

- | | | |
|-----------------------------|-------------------|-----------------------------------|
| 1. Alcohol: | R-OH | <i>methanol</i> or methyl alcohol |
| 2. Aldehyde | R-COH | <i>hexanal</i> |
| 3. Carboxylic Acids: | R-COOH | <i>methanoic acid</i> |
| 4. Ethers: | R-O-R' | methyl ethyl ether |
| 5. Amines | R-NH ₂ | propylamine |
| 6. Esters | R-COO-R' | butyl propanoate |

5. Isomers

1. **Geometric:** *cis, trans*
2. **Positional:** location of functional group or double/triple bond
3. **Optical**

6. Reactions

1. **Substitution:** Alkanes + halides: $\text{CH}_4 + \text{Cl}_2 \rightarrow \text{CH}_3\text{Cl} + \text{HCl}$
2. **Addition:** Alkene + halide/hydrogen: $\text{CH}_2\text{CH}_2 + \text{H}_2 \rightarrow \text{CH}_3\text{CH}_3$
3. **Elimination** Alkene: eliminate across double bond
4. **Ester formation:** acid + alcohol \rightarrow water + ester